

Name: _____ Date: _____
 Algebra 2 CC: Adding and Subtracting Radicals

Recall that the sum or difference of fractions or of similar algebraic terms is found by using the distributive property.

$$\begin{aligned}\frac{2}{5} + \frac{4}{5} &= \frac{1}{5} \times 2 + \frac{1}{5} \times 4 & 2x + 4x &= x(2 + 4) \\ &= \frac{1}{5}(2 + 4) & &= x(6) \\ &= \frac{1}{5}(6) & &= 6x \\ &= \frac{6}{5}\end{aligned}$$

We do not write all of the steps shown above when adding fractions or algebraic terms. The principles that justify each of these steps assure us that the results are correct.

We can apply the same principles to the addition or subtraction of radical expressions. To express the sum or difference of two radicals as a single radical, the radicals must have the same index and the same radicand, that is, they must be like radicals. We can use the same procedure that we use to add or subtract like terms.

$$\begin{array}{lll}2\sqrt{5} + 4\sqrt{5} & 4\sqrt{3b} - 3\sqrt{3b} & \sqrt[3]{2} + 7\sqrt[3]{2} \\= \sqrt{5}(2 + 4) & = \sqrt{3b}(4 - 3) & = \sqrt[3]{2}(1 + 7) \\= \sqrt{5}(6) & = \sqrt{3b}(1) & = \sqrt[3]{2}(8) \\= 6\sqrt{5} & = \sqrt{3b} & = 8\sqrt[3]{2}\end{array}$$

Two radicals that do not have the same radicand or do not have the same index are unlike radicals. The sum or difference of two unlike radicals cannot be expressed as a single radical if they cannot be written as equivalent like radicals. Each of the following, $\sqrt{2} + \sqrt{3}$, $\sqrt[3]{2} + \sqrt{2}$, and $\sqrt[4]{2} + \sqrt{3}$, are the sums of unlike radicals and are in simplest radical form.

In 3–38 write each expression in simplest form. Variables in the radicand with an even index are non-negative. Variables occurring in the denominator of a fraction are non-zero.

3. $\sqrt{2} + 5\sqrt{2}$

5. $8\sqrt{3} + \sqrt{3}$

7. $\sqrt{50} + \sqrt{2}$

9. $\sqrt{250a^2} + \sqrt{10a^2}$

11. $\sqrt{24xy^2} + \sqrt{54xy^2}$

13. $\sqrt{98c^5} - \sqrt{18c^5}$

15. $4b\sqrt{24b^3} + \sqrt{54b^5}$

17. $\sqrt{5} + \sqrt{\frac{1}{5}}$

19. $14\sqrt{\frac{1}{7}} + \sqrt{28}$

21. $a\sqrt{45} + \sqrt{20a^2} - 5\sqrt{2a}$

23. $2\sqrt{3y} - 5y^2 + 4\sqrt{3y} + \sqrt{36y^4}$

25. $\sqrt{12} - \sqrt{24} + \sqrt{48} + \sqrt{27}$

27. $\sqrt{\frac{1}{6}} + \sqrt{\frac{8}{3}} - \sqrt{\frac{2}{3}}$

29. $\sqrt[3]{54} + \sqrt[3]{128}$

31. $\sqrt{9x} + \sqrt{25x}$

33. $\sqrt{8a} - \sqrt{2a}$

35. $\sqrt{63a^2} - \sqrt{45a^2}$

37. $\sqrt{50x^3} + \sqrt{200x^3}$

4. $6\sqrt{3} - 4\sqrt{3}$

6. $5\sqrt{7} - \sqrt{7}$

8. $3\sqrt{5y} - \sqrt{20y}$

10. $8\sqrt{11b^4} - \sqrt{99b^4}$

12. $\sqrt{200a^7} - \sqrt{50a^7}$

14. $x\sqrt{32x} + \sqrt{128x^3}$

16. $3x^3\sqrt{80} + 2\sqrt{125x^6}$

18. $\sqrt{24} + 2\sqrt{\frac{3}{2}}$

20. $\sqrt{\frac{1}{2x}} + \sqrt{\frac{1}{2x}}$

22. $x\sqrt{600} - 2\sqrt{24x^2} + 4x\sqrt{96}$

24. $\sqrt{162a^4b^3} + 3 - ab\sqrt{18a^2b} - 1$

26. $5\sqrt{\frac{1}{5}} - \sqrt{\frac{1}{10}} + \sqrt{20}$

28. $\sqrt[3]{2} + \sqrt[3]{16}$

30. $\sqrt[4]{48} - \sqrt[4]{3}$

32. $\sqrt{100y} - \sqrt{25y}$

34. $\sqrt{18b^2} + \sqrt{800b^2}$

36. $\sqrt{4ab^2} - \sqrt{ab^2}$

38. $\sqrt{49x^3} - 2x\sqrt{4x}$